Project Summary

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Earthquake Engineering Research Program Special Studies

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Objective: Conduct special studies and develop solutions to complex earthquake engineering problems arising from seismic safety evaluations of Corps civil works projects, primarily reservoir dams. Provide expertise and counsel on Civil Works earthquake engineering problems, investigational and research programs, and related CE activities. The research results have immediate user application responsive to specific issues even though additional research may be merited in an independent work unit for complete resolution of the issues. Direct liaison with users and CE assures expedient application of research results.

Description: Studies are undertaken in order of priorities established with CE Technical Monitors and technical experts for special problems in earthquake engineering. Expedient solutions are suggested or independent research work units are proposed to develop solutions to CW research needs surfaced in R&D workshops. Studies are accomplished by collection of data, survey of literature, synthesis of information from CE offices and analytical studies. Engineers with specialized capabilities are utilized to accomplish each study. Experts well qualified in various aspects of soil mechanics of primary interest to the CE are consulted for advice and guidance. Included in this work unit is a task to develop plans for expedient reconnaissance of earthquake-damaged sites that are pertinent to geotechnical and structural aspects of dam safety.

2000 Taiwan earthquake damage.

Accomplishments: PRIOR TO FY99: Coordinated EQEN research with others, notably NFS, NIST, NCEER, EERI, SNDR, BOND, NEHRP, and BSSC. Conducted reconnaissance of Northridge and Kobe earthquakes. Participated in UJNR mtgs and conducted '96 US-Japan workshop on seismic safety of dams. Supported NRC fellow to develop software for Newmark-type sliding block analyses. Conducted vibration testing of Seven Mile Concrete Dam, in cooperation with the Canadian government. Developed NSF-funded cooperative proposal to perform explosive shaking tests on dams in China. Provided outreach to students from Univ. of Puerto Rico and NC A&T. Initiated DYNAFLOW analysis of Upper San Fernando Dam (USFD) for case history comparison with TARA3, STUBBS, and FLAC. Visited China to coordinate full scale shaking experiments of Longyangxia Dam. Conducted international workshop on

reservoir bottom adsorption. Reviewed analytical studies of Seven Mile Dam shaking experiments. FY99 AND AFTER: Continued coordination and outreach efforts, including Corps representation at FHWA/NCEER program reviews, UJNR meetings, Mid-America Earthquake Engineering Center, NSF panels, interagency funded workshops on liquefaction and residual strength; conducted full-scale shaking experiment in China; published proceedings of U.S.-Japan workshop on seismic analysis of dams; completed DYNAFLOW analysis of USFD; co-hosted U.S.-Japan workshop on centrifuge testing for liquefaction research; co-hosted 2d U.S.-Japan workshop on seismic safety of dams. Conducted reconnaissance trips to Earthquakes in Taiwan, Turkey during FY2000 and during FY2001 to India, Seattle, San Salvador. During FY 2001: attended UNJR and the 2nd US National Ground Motion Mapping Workshop, Supported two national workshops to identify Corps needs in seismic remediation of hydraulic infrastructure, and contributed to development of the FEMA Public Building Assessment Model.

Problem: Special studies arise in current seismic safety and remediation studies that are not amenable to direct solution or specific structured research, but which require expert counsel or expedient guidance based on experienced judgment. The counsel and advice of technical experts are also needed in formulating rational investigational research programs to address the complex, often unique character of the priority research requirements.

Benefits: Permits rapid response to field problems on short notice. Provides for interaction between scientists and engineers of the Corps of Engineers, other Government agencies, and other technical experts in this country and abroad on earthquake engineering matters, and provides opportunities to gain valuable information and to engage in cooperative research.